

***Pseudodactylogyroides* gen. n. (Monogenea: Ancyrocephalidae,  
Pseudodactylogyrinae subf. n.), with a Redescription  
of *P. apogonis* (Yamaguti, 1940) comb. n.**

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**ABSTRACT**—*Pseudodactylogyroides* gen. n. (Monogenea) is erected to include *P. apogonis* (Yamaguti, 1940) comb. n. (syn.: *Dactylogyrus apogonis* Yamaguti, 1940) as type and only species. The new genus is closely related to *Pseudodactylogyrus* Gussev, 1965, but differs from it in having a second pair of hamuli and in arrangement of the marginal hooks. The presence of the second pair of hamuli in the new genus suggests its relatedness to the family Ancyrocephalidae. *Pseudodactylogyrinae* subf. n. is created in Ancyrocephalidae to allocate *Pseudodactylogyrus* (type genus) and *Pseudodactylogyroides* gen. n. on the basis of the characteristic features of the opisthohaptor and male terminal genitalia. It is speculated that this group has evolved from an ancyrocephalid ancestor of marine origin and gradually lost a pair of hamuli with osmotic change experienced by their hosts.

### INTRODUCTION

Almost all *Dactylogyrus* species occur on cypriniform fish [1], with an exception of *D. apogonis* Yamaguti, 1940, which is found on a Japanese coastal fish, *Apogon semilineatus* (Apogonidae). *D. apogonis* has many peculiar structures like supplementary pieces of hamuli ("supporting rods" according to the original author), a bulla-like base of cirrus, a semi-annular plate at the genital pore and a narrow duct arising from receptaculum seminis [2]. On the other hand, detailed information was not given in the original description on some important structures like marginal hooks. This paper is intended to make a more detailed description of the parasite and give special consideration to the systematic position, based on freshly collected specimens. As a conclusion, this parasite is not included in the genus *Dactylogyrus*, and represents a new genus *Pseudodactylogyroides*.

### MATERIALS AND METHODS

A total of 37 specimens of the host, *Apogon*

*semilineatus* (5.9–9.5 cm in body length) were examined, 15 of which were infected with the parasite (prevalence of infection 41%) with the intensity of infection ranging from 1 to 6. About half of the fresh parasite specimens were fixed in Schaudinn's solution or AFA under slight pressure and stained with Heidenhein's iron haematoxylin or alum carmine for description of general structures. The other half were fixed in ammonium picrate-glycerin for description of hard parts. Drawings were made with the aid of a camera lucida. Measurements are given in  $\mu\text{m}$ .

### REDESCRIPTION OF THE SPECIES

*Pseudodactylogyroides apogonis* (Yamaguti, 1940)  
gen. et comb. n.  
(Figs. 1–7)

*Habitat*: On gill filaments of *Apogon semilineatus* Temminck et Schlegel (standard Japanese name: Nenbutsu-dai).

*Dates of collection*: 25 May 1981, 11 June 1982 and 18 July 1984.

*Locality*: Aburatsubo, Kanagawa Prefecture, Japan.

*No. of specimens examined*: 19.

*Specimens:* Deposited in the Meguro Parasitological Museum, Tokyo, M. P. M. Coll. No. 19414 and in the author's collection.

*Redescription:* Body elongate, 690–1140 long by 190–290 wide at about middle, with truncated anterior end. Three pairs of head organs opening subterminally on both anterior sides, the gland cells lying on both sides of pharynx. Eye spots in two pairs, very often diffused, anterodorsal to pharynx.

Opisthohaptor (Fig. 2) 115–215 in diameter, a little wider than posterior end of body proper. Hamuli (Fig. 3) stout with points directing ventrally; 43–48 in total length, 37–41 in base length, 15–17 in point length. Internal processes of hamuli, 11–14 long, indistinctly demarcated from external ones which are 5–6 long, forming approximately a right angle with the latter. A pair of supplementary pieces, 23–26 long ("supporting rods" according to the original author), irregularly noded basally and tapering anteriorly, attached to anterior ends of internal processes of hamuli. Bar, 45–53 long by 6–8 wide, almost straight, with a notch in the middle, lying ventrally to hamuli. Marginal hooks (Fig. 4), of larval type, all arranged on the margin of haptor (Fig. 2), measuring 10–12 long. A pair of "needles" (Fig. 5), 16–17 long, distant from each other, and posterior or parallel to hamuli. Each "needle" consisting of root and point part; root part uniform in width with blunted end and point part slightly curved with sharp end. Tendon loops guarding needles approximately from middle of basal part to almost tip of point. "Needles" having no connection with any pair of marginal hooks. No bar present, connecting each pair of "needles". Cement gland very well developed, originating in posterior body proper, opening on opisthohaptor, sometimes forming cement vesicles near and around hamuli.

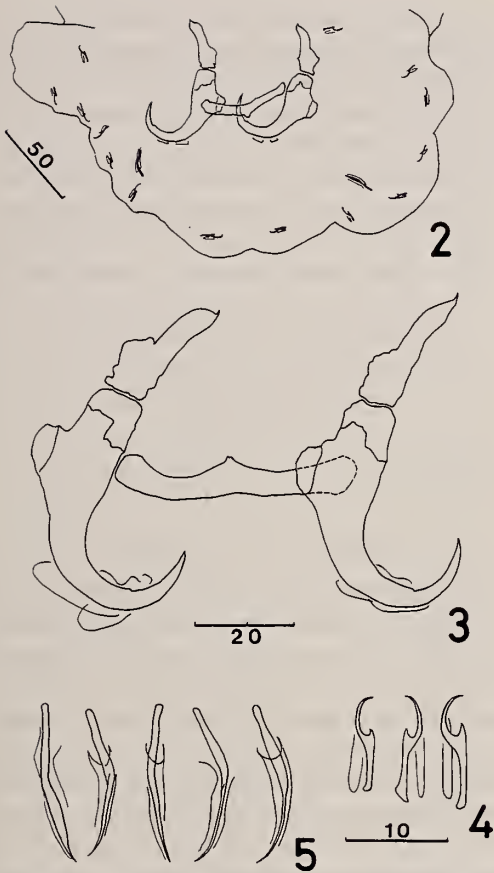
Mouth opening just in front of pharynx. Latter 57–81 long by 45–64 wide. Esophagus relatively long, about 30–60 in length, with well developed postpharyngeal gland on each side. Intestine united posterior to testis.

Testis elliptical, in posterior body proper, 89–125 long by 61–97 wide. Vas deferens emerging at the top of testis, looping around left intestinal limb and turning back to form vesicula

seminalis which lies in left interintestinal region just posterior to bifurcation. Vesicula seminalis fusiform, 52–95 long by 21–47 wide, opening into cirrus through prostatic reservoir (Fig. 6). Latter, rounded, 46–68 in diameter, directly attached to the base of cirrus. Prostatic cells distributed in interintestinal region from the level of vesicula



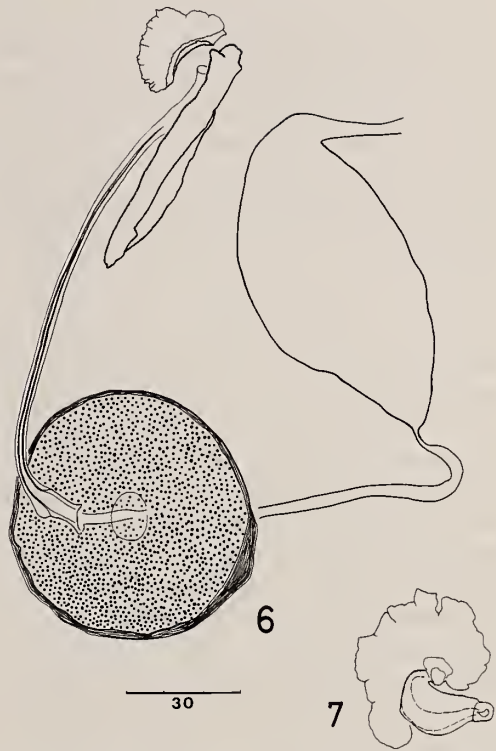
FIG. 1. Whole worm of *Pseudodactylogyroides apogonis* gen. et comb. n., ventral view. Scale in  $\mu\text{m}$ .



Figs. 2-5. Attaching apparatus of *Pseudodactylogyroides apogonis* gen. et comb. n.  
2: Opisthohaptor, ventral view. 3: Ventral hamuli and bar. 4: Marginal hooks. 5: "Needles". Scales in  $\mu\text{m}$ .

seminalis to that of anterior ovary. Cirrus tubular, curved and gradually widened basally, guarded by a sheath which is always a little longer than cirrus tube (Fig. 6). Cirrus 120-130 long by 1 wide at middle with widened proximal end (5-8 in width). Accessory piece rod-shaped, 53-74 long, flanged on the other side of cirrus. At distal end of cirrus sheath is a semi-circular fan-shaped hard part (23-28 long by 10-14 wide) with a thin, finely serrated outer and a thick smooth inner margin. Genital pore, 22-90 from pharynx, surrounded by well developed circular muscle fibers firmly connected with cirrus accessory piece (Fig. 1).

Ovary elliptical, just in front of or slightly overlapping testis, 104-147 long by 42-73 wide.



Figs. 6-7. Genital organs of *Pseudodactylogyroides apogonis* gen. et comb. n.  
6: Male terminal genitalia. 7: Vaginal hard part. Scale in  $\mu\text{m}$ .

Oviduct emerging at the top of ovary, soon receiving receptaculum seminis (37-95 long by 17-55 wide) and Mehlis' gland lying about midway between receptaculum seminis and prostatic reservoir. Vagina opening on right side in interintestinal region in front of ovary, consisting of a thin, irregularly serrated outer expansion (23-50 in diameter) with vaginal pore in the center and a somewhat hardened and curved tube (20-31 long by 9-14 wide) which is connected with receptaculum seminis (Fig. 7). Vitellaria well developed, co-extensive with intestine.

### DISCUSSION

There has been no descriptive report on *Dactylogyryrus apogonis* since Yamaguti [2] reported it as a new species. The present redescription of the parasite includes many new findings; 1) The opis-



thohaptor and the hamuli direct ventrally. 2) The marginal hooks are all of larval type. No additional tendon ligaments [3] ("additional hooks" after Mizelle and Price [4]) were observed. Instead, a pair of "needles" were present, which were overlooked in the original description. They are different in shape and size from marginal hooks and additional tendon ligaments of any lower monogeneans (not only of *Dactylogyrus*, but also of *Anacanthorus* Mizelle et Price, 1965 and *Trianchoratus* Price et Berry, 1966). The "needles" are quite similar in shape to hamuli, especially to those commonly observed in lower monogeneans in their early developmental stages and also similar to the undeveloped hamulus of *Heteronchocleidus* (see [1]). They are regarded as another pair of hamuli, since they do not correspond to any other opisthohaptoral structures. It appears that they have worked no more as attaching apparatus. Early developmental stages of the hamuli were not observed probably because the specimens were all fully grown adults. 3) There is the only one prostatic reservoir, which was originally described as a bulla-like base of cirrus. The two reservoirs in the original description were no more than a mass of prostatic cells and the accumulation of the prostatic secretions around the real prostatic reservoir. This was reconfirmed by an examination of the type specimens of *Dactylogyrus apogonis* deposited in the Meguro Parasitological Museum. 4) Unlike the original description, no duct was found arising from the junction of the receptaculum seminis with the oviduct.

From these features, the new genus *Pseudodactylogyroides* is erected, with *P. apogonis* comb. n. as type species. *Pseudodactylogyroides* is closely related to *Pseudodactylogyrus* in the orientation of the opisthohaptor and ventral hamuli, the presence of the supplementary pieces of the ventral hamuli, larval type marginal hooks, the absence of additional tendon ligaments and the single prostatic reservoir, but differs from it in possessing another pair of hamuli and in arrangement of the marginal hooks; in the present new genus they are all marginal, while in *Pseudodactylogyrus*, two of them are central. Gussev [5] assigned some genera with no, two or three hamuli to the family Ancyrocephalidae, typical ones of which have four

(two pairs of) hamuli, on the theory that the members of these genera have lost some or all of the hamuli secondarily. The presence of four hamuli in *Pseudodactylogyroides* suggests the relatedness of the new genus and *Pseudodactylogyrus* to the family Ancyrocephalidae rather than Dactylogyridae or any other existing families with two hamuli. *Protogyrodactylus* Johnston et Tiegs, 1922 in Ancyrocephalidae may be closely related to these genera in having supplementary pieces of ventral hamuli and single prostatic reservoir, etc. *Pseudodactylogyroides* and *Pseudodactylogyrus* should be included in Ancyrocephalidae. They are quite unique in the family in the structures of the opisthohaptor and the genital organ and it is reasonable to create a new subfamily for them.

#### ***Pseudodactylogyrinae* subf. n.**

*Subfamily diagnosis* Ancyrocephalidae: Head truncated. Opisthohaptor with one or two pairs of hamuli, one connecting bar and 14 marginal hooks. One pair of hamuli well developed, directing ventrally, provided with a pair of supplementary pieces at their roots. Second pair of hamuli, if present, vestigial, without a connecting bar. Marginal hooks, of larval type. Two pairs of eye spots present. Pharynx well developed. Intestinal limbs without diverticula, united posteriorly. Testis rounded or elongated, median. Vas deferens looping around left intestinal limb. Vesicula seminalis present. Prostatic reservoir single, directly attached to cirrus. Cirrus tubular with accessory piece. Genital pore median at level of bifurcation. Ovary rounded or elongated, at about middle of body, immediately pretesticular. Vagina opening dextral, armed or unarmed. Receptaculum seminis present. Vitellaria co-extensive with intestine. Parasites of freshwater and marine teleosts.

Type genus: *Pseudodactylogyrus* Gussev, 1965

Other genus: *Pseudodactylogyroides* gen. n.

#### ***Pseudodactylogyroides* gen. n.**

*Generic diagnosis* Ancyrocephalidae, *Pseudodactylogyrinae*: Body elongated with three pairs of head organs. Opisthohaptor armed with two pairs of hamuli, one connecting bar and 14

marginal hooks. Ventral hamuli well developed, provided with a bar and a pair of supplementary pieces. Another pair of hamuli vestigial without any connecting bar. Marginal hooks all peripheral. Cement gland well developed. Cement vesicles usually present in opisthohaptor. Cirrus tubular, with rod-shaped accessory piece and a hard plate near its distal end. Vagina armed. Other characters are as in the subfamily diagnosis.

Type and only species: *P. apogonis*  
(Yamaguti, 1940) comb. n.  
(syn.: *Dactylogyrus apogonis*  
Yamaguti, 1940)

*Apogon semilineatus*, the host for *P. apogonis* gen. et comb. n., is a coastal fish. *Pseudodactylogyrus* has been recorded from the Japanese goby, *Acanthogobius flavimanus*, in brackish water and from *Anguilla* spp. in freshwater localities [6]. The goby and eels are quite distant phylogenetically from each other, but it should be noted that they both are of marine origin, having changed their habitat from sea water to brackish or fresh water. Since the "needles" in the present new genus are thought to be rudiments of the dorsal hamuli in ancyrocephalids, the new subfamily Pseudodactylogyrinae has evolved, presumably, from a marine ancyrocephalid ancestor (probably *Protogyrodactylus*-type) and gradually lost a pair of hamuli secondarily during the evolution with osmotic change experienced by their hosts.

#### ACKNOWLEDGMENTS

The author would like to express his cordial thanks to Dr. A. V. Gussev, Zoological Institute, Academy of Sciences, U.S.S.R., for his valuable suggestions and to Dr. S. Kamegai, Director of Meguro Parasitological Museum, Tokyo, for the loan of the type series of *Dactylogyrus apogonis* Yamaguti, 1940 deposited there.

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